EXHIBIT 1

October 30, 2014

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Case Name: *Bacho v. Rough Country, LLC*

As requested, Kineticorp investigated and reconstructed a multiple vehicle crash that occurred at approximately 8:06 PM on December 22, 2012. The crash occurred at the intersection of Lower Fayetteville Road and Newnan Crossing Bypass in Newnan, Georgia. A southbound 1999 Chevrolet K1500 pickup truck, driven by Taylor Long, failed to stop at a red light and impacted an eastbound 2012 Toyota Sienna driven by Natalie Bacho. According to the police report and phone records, Mr. Long was on the phone with his girlfriend before and during the accident.

Figure 1

Figure 1 is a photograph looking east taken by police that depicts the rest position of the Toyota Sienna and Chevrolet K1500. Eastbound and westbound traffic lanes are separated by a double yellow line, northbound and southbound traffic lanes are separated by a narrow median. The accident occurred at the intersection of southbound Newnan Crossing Bypass and Lower Fayetteville Road. No adverse weather conditions were reported at the time of the accident and the road surface was dry. The posted speed for both roadways at this intersection was 45 mph.

Summary of Conclusions: As a result of our investigation and analysis, Kineticorp reached the following conclusions related to this crash.

- This accident was caused by Mr. Long's inattention and failure to stop at the red light.
- At impact with the Toyota, the Chevrolet was traveling approximately 38 mph.
- When it was impacted by the Chevrolet, the Toyota was traveling approximately 35 mph.
- The Chevrolet experienced a change in velocity (ΔV) of approximately 23 mph.
- The Toyota experienced a change in velocity (ΔV) of approximately 22 to 23 mph.
- The passenger in the third row left seat of the Toyota experienced a peak acceleration of about 40 times gravity.
- In terms of kinetic energy the impact experienced by the Toyota was approximately 73% more severe than the New Car Assessment Program side impact test.
- The addition of the lift kit and aftermarket tires to the Chevrolet did not adversely affect the braking capabilities of the truck.
- The addition of the lift kit and aftermarket tires to the Chevrolet did not significantly increase the amount of intrusion into the Toyota.
- If the Chevrolet had been lowered such that it engaged the top portion along the rim of the Toyota's left rear wheel, intrusion to the Toyota would not have been prevented.

Basis for Conclusions: The remainder of this report describes the basis for these conclusions and outlines the procedure through which they were reached. The procedure described below utilized reliable methods, techniques and processes which conform to standard and accepted practices within the field of traffic accident reconstruction. These opinions are based on my education, training and experience in the field of engineering and accident reconstruction. In addition, these opinions are based on the physical evidence, case specific materials and analysis of relevant technical materials. The above-listed conclusions, to which this procedure led, were reached to a reasonable degree of engineering certainty.

Procedure:

- In conducting our investigation and analysis, Kineticorp reviewed and analyzed the provided documents, photographs and other materials listed in Appendix A.
- Kineticorp obtained aerial photographs of the accident location.
- Kineticorp inspected, documented and photographed the accident site on July 3, 2014 and September 26, 2014. The accident site was surveyed during the July 3, 2014 inspection.
- Kineticorp inspected, documented, photographed and scanned the subject Chevrolet K1500 on July 17, 2014
- Kineticorp inspected, documented, photographed, scanned and tested an exemplar 1998 Chevrolet K1500.
- Kineticorp inspected, documented, photographed and scanned an exemplar 2012 Toyota Sienna.
- Kineticorp obtained published technical specifications for the vehicles involved in this crash. These specifications were used to generate scale models of the vehicles and to calculate inertial properties for the vehicles based on formulas in the following publications. A vehicle's inertial properties include its weight, center of mass location and its moments of inertia. These properties relate to the vehicle's resistance to changes in its translational and rotational motion.
  - Allen, Wade R., David H. Klyde, Theodore J. Rosenthal, and David M. Smith. "Estimation of Passenger Vehicle Inertial Properties and Their Effect on Stability and Handling," SAE Technical Paper 2003-01-0966. Warrendale: Society of Automotive Engineers, 2003.
  - Baruh, Haim. *Analytical Dynamics*. Boston: WCB/McGraw-Hill, 1999.

  - Hibbeler, R. C., *Engineering Mechanics: Statics and Dynamics 6th Ed*. New York: Macmillan Pub. Co., 1992.
  - MacInnis, Duane. "A Comparison of Moment of Inertia Estimation Techniques for Vehicle Dynamics Simulation," SAE Technical Paper 970951. Warrendale: Society of Automotive Engineers, 1997.
  - Tilley, Alvin R. *The Measure of Man and Woman: Human Factors in Design*. Revised Ed. New York: Wiley, 2002.

- Kineticorp produced scaled three dimensional computer models of the vehicles based on scan data collected during our inspections, the obtained vehicle specification data and photogrammetric analysis.

- Kineticorp produced a computer model of the crash site containing the roadway and intersection geometries, along with the physical evidence deposited by the vehicles during the crash. This computer model was created based on survey data collected during Kineticorp's site investigation, and survey data and diagrams created by police during their investigation of the crash. Kineticorp supplemented the computer model of the scene with roadway evidence and vehicle locations by performing photogrammetric analysis on provided photographs taken at the scene of the accident. Photogrammetry encompasses techniques used to obtain measurements and three-dimensional positional data from photographs. The following technical literature describes the photogrammetric principles and techniques employed by Kineticorp. These principles and techniques are widely accepted and used within the field of accident reconstruction.

  - Baker, Kenneth S., "Chapter 9: Photogrammetry for Collision Analysis." *Traffic Collision Investigation*. Evanston: Northwestern University Center for Public Safety, 2001.
  - Brach, Raymond M. "Chapter 10: Photogrammetry." *Vehicle Accident Analysis and Reconstruction Methods*. Warrendale: Society of Automotive Engineers, 2005.
  - Breen, Kevin C. "Application of Photogrammetry to Accident Reconstruction," SAE Technical Paper 861422. Warrendale: Society of Automotive Engineers, 1986.
  - Chou, C., R. McCoy, S. Fenton, W. Neale, and N. Rose. "Image Analysis of Rollover Crash Tests Using Photogrammetry," SAE Technical Paper 2006-01-0723. Warrendale: Society of Automotive Engineers, 2006.
  - Fenton, Stephen, Wendy Johnson, James LaRocque, Nathan Rose, and Richard Ziernicki. "Using Digital Photogrammetry to Determine Vehicle Crush and Equivalent Barrier Speed (EBS)," SAE Technical Paper 1999-01-0439. Warrendale: Society of Automotive Engineers, 1999.
  - Fenton, Stephen, Richard Ziernicki, Nathan Rose, and Wendy Johnson. "Using Digital Photogrammetry to Determine Crash Severity," Rep. London: ICrash 2000, International Crashworthiness Conference, The Royal Aeronautical Society, 2000.
  - Fenton, Stephen, W. Neale, N. Rose, and C. Hughes. "Determining Crash Data Using Camera-Matching Photogrammetric Technique," SAE Technical Paper 2001-01-3313. Warrendale: Society of Automotive Engineers, 2001.
  - Fenton, Stephen, and Richard Kerr. "Accident Scene Diagramming Using New Photogrammetric Technique," SAE Technical Paper 970944. Warrendale: Society of Automotive Engineers, 1997.
  - Husher, Stein E., Michael S. Varat, and John F. Kerhoff. "Survey of Photogrammetric Methodologies for Accident Reconstruction," Rep. Vancouver: Proceedings of the Canadian Multi-Disciplinary Road Safety Conference VII, 1991.
  - Neale, W. T.C., S. Fenton, S. McFadden, and N. A. Rose. "A Video Tracking Photogrammetry Technique to Survey Roadways for Accident Reconstruction," SAE Technical Paper 2004-01-1221. Warrendale: Society of Automotive Engineers, 2004.
  - Pepe, Michael D. "Accuracy of Three-Dimensional Photogrammetry as Established by Controlled Field Tests," SAE Technical Paper 930662. Warrendale: Society of Automotive Engineers, 1993.
  - Rose, Nathan A., W. T.C. Neale, S. J. Fenton, D. Hessel, R. W. McCoy, and C. C. Chou. "A Method to Quantify Vehicle Dynamics and Deformation for Vehicle Rollover Tests Using Camera-Matching Video Analysis," SAE Technical Paper 2008-01-0350.Warrendale: Society of Automotive Engineers, 2008.
  - Rucoba, R., A. Duran, L. Carr, and D. Erdeljac. "A Three Dimensional Crush Measurement Methodology Using Two-Dimensional Photographs," SAE Technical Paper 2008-01-0163. Warrendale: Society of Automotive Engineers, 2008.

- Kineticorp reconstructed the motion of the vehicles through the scene evidence using the scaled computer model containing the crash scene, the physical evidence and the subject vehicles. The vehicle motion analysis relied on our own research in the area of tire mark interpretation and on other widely utilized and accepted literature related to the interpretation of physical evidence from vehicular crashes. A sampling of this literature is listed below:

  - Bartlett, Wade. "Skidding Friction: A Review of Recent Research," Mechanical Forensics Engineering Services, LLC., February 17, 2007. Web. 4 Oct 2012. <http://www.mfes.com/friction.html>.
  - Beauchamp, Gray, David Hessel, Nathan A. Rose, and Stephen J. Fenton. "Determining Steering and Braking Levels from Yaw Mark Striations," SAE Technical Paper 2009-01-0092. Warrendale: Society of Automotive Engineers, 2009.
  - Daily, John, Nathan S. Shigemura, and Jeremy Daily. *Fundamentals of Traffic Crash Reconstruction*. Jacksonville: Institute of Police Technology and Management, University of North Florida, 2006.
  - Fricke, Lynn B. *Traffic Accident Reconstruction*. Evanston, IL: Northwestern University Traffic Institute, 1990.
  - Fricke, Lynn B. *Traffic Crash Reconstruction*, 2nd Edition. Evanston, IL: Northwestern University Traffic Institute, 2010.
  - Reveley, Mary S. "A Comparison Study of Skid and Yaw Marks," SAE Technical Paper 890635. Warrendale: Society of Automotive Engineers, 1989.

- Based on the reconstructed motion of the vehicles, Kineticorp completed a speed analysis using Conservation of Energy and Conservation of Momentum analysis. These principles are described and validated extensively in the literature pertaining to vehicular accident reconstruction. The following list is a sampling of that literature:
  - Baker, Kenneth S., *Traffic Collision Investigation*, Evanston, IL: Northwestern University Center for Public Safety, 2001.
  - Brach, Raymond M., and R. Matthew Brach. *Vehicle Accident Analysis and Reconstruction Methods*, Warrendale: Society of Automotive Engineers, 2005.
  - Daily, John, Nathan S. Shigemura, and Jeremy Daily. *Fundamentals of Traffic Crash Reconstruction*. Jacksonville: Institute of Police Technology and Management, University of North Florida, 2006.
  - Fricke, Lynn B. *Traffic Crash Reconstruction*, 2nd Edition. Evanston, IL: Northwestern University Traffic Institute, 2010.
- Kineticorp utilized a crash analysis software package known as HVE-3D. This software is widely used and accepted within the accident reconstruction community and it has been validated in the following literature:
  - Day, Terry, "Simulation of Tire Interaction with Curb and Irregular Terrain," Engineering Dynamics Corporation White Paper WP-2005-6, 2005.
  - Day, Terry, "Validation of the SIMON Model for Vehicle Handling and Collision Simulation – Comparison of Results with Experiments and Other Models," SAE Technical Paper 2004-01-1207. Warrendale: Society of Automotive Engineers, 2004.
  - Day, Terry, "SIMON: A New Vehicle Simulation Model for Vehicle Design and Safety Research," SAE Technical Paper 2001-01-0503. Warrendale: Society of Automotive Engineers, 2001.
  - Day, Terry, "An Overview of the HVE Vehicle Model," SAE Technical Paper 2000-01-0849. Warrendale: Society of Automotive Engineers, 2000.
  - Day, Terry, "Validation of Several Reconstruction and Simulation Models in the HVE Simulation Visualization Environment," SAE Technical Paper 960891. Warrendale: Society of Automotive Engineers, 1996.
  - Day, Terry, "Three Dimensional Reconstruction and Simulation of Motor Vehicle Accidents," SAE Technical Paper 960890. Warrendale: Society of Automotive Engineers, 1996
  - Day, Terry, "Application and Misapplication of Computer Programs for Accident Reconstruction," SAE Technical Paper 890738. Warrendale: Society of Automotive Engineers, 1989.
  - Fay, Richard J., "Using Imported Objects and Images in HVE," SAE Technical Paper 980019. Warrendale: Society of Automotive Engineers, 1998.
  - Neptune, James A., "Overview of an HVE Vehicle Database," SAE Technical Paper 960896. Warrendale: Society of Automotive Engineers, 1996.
- Kineticorp analyzed the event data from the subject vehicles. The airbag control modules from these vehicles were capable of recording crash related data and are supported by the Crash Data Retrieval (CDR) system. A sample of these publications is listed below:
  - Brown, Roger, et al., "Confirmation of Toyota EDR Pre-crash Data," SAE Technical Paper 2012-01-0998. Warrendale: Society of Automotive Engineers, 2012.
  - Chidester, Augustus "Chip" B., et al. "Real World Experience with Event Data Recorders," Paper Number 247. National Highway Traffic Safety Administration, 2001.
  - Comeau, Jean-Louis, Dainius J. Dalmotas, "Event Data Recorders in Toyota Vehicles," Proceedings of the 21st Canadian Multidisciplinary Road Safety Conference. Halifax: May 8-11, 2011.
  - Exponent Failure Analysis Associates, "Testing and Analysis of Toyota Event Data Recorders," Menlo Park, CA: 2011.
  - Gabler, H. Clay, John Hinch, and John Steiner. *Event Data Recorders - A Decade of Innovation*. Rep. no. PT-139. Warrendale: Society of Automotive Engineers, 2008.
  - Gabler, C. et al., "Preliminary Evaluation of Advanced Air Bag Field Performance Using Event Data Recorders," DOT HS 811 015. Washington, D.C.: National Highway Traffic Safety Administration, 2007.
  - Ishikawa, Hirotoshi, et al., "Study on Pre-Crash and Post-Crash Information Recorded in Electronic Control Units (ECUS) Including Event Data Recorders." Japan, Paper Number *09-0375*.
  - National Highway Traffic Safety Administration, "Event Data Recorder – Pre Crash Data Validation of Toyota Products," NHTSA –NVS-2011-ETC-SR07. Washington, D.C., February 2011.
  - Niehoff, Peter."Evaluation of Event Data Recorders in Full Systems Crash Tests," Rep. no. 05-0271. Washington D.C.: National Highway Traffic Safety Administration.
  - Ruhl, Roland, et al. "Numerical Methods for Evaluating ECM Data in Accident Reconstruction and Vehicle Dynamics". SAE Technical Paper 2003-01-3393. Warrendale: Society of Automotive Engineers, 2003.
  - Ruth, Richard, et al. "Accuracy of Event Data in the 2010 and 2011 Toyota Camry During Steady State and Braking Conditions," SAE Technical Paper 2012-01-0999. Warrendale: Society of Automotive Engineers, 2012.
  - Takubo, Nobuaki, et al. "Study of Characteristics of Event Data Recorders in Japan," SAE Technical Paper 2009-01-0883. Warrendale: Society of Automotive Engineers, 2009.
  - Takubo, Nobuaki, et al. "Study of Characteristics of Event Data Recorders in Japan; Analysis of J-NCAP and Thirteen Crash Tests," SAE Technical Paper 2011-01-0810. Warrendale: Society of Automotive Engineers, 2011.

Accident Scene

In the area of the crash, Newnan Crossing Bypass consists of two through lanes each for northbound and southbound traffic as well as dedicated left and right turn lanes separated by medians and painted gore areas. Lower Fayetteville Road consists of a single travel lane for eastbound and westbound traffic and dedicated turn lanes separated by painted lines. The intersection is controlled by lighted overhead signals. Figure 2, below, is a photograph taken by police on the night of the crash. The photograph was taken facing in the southbound direction of travel of the Chevrolet K1500. As seen in the photograph, the collision occurred in the intersection of these two roads. Mr. Long's Chevrolet K1500, right, and the Toyota Sienna, left, can be seen in Figure 2.

Figure 2 – Police Photograph of Scene

Figure 3 contains a photograph taken by police on the night of the crash. This photograph shows the two vehicles at their respective points of rest. Orange spray paint on the roadway is also visible in the photographs. This paint was used by police to mark the locations of physical evidence and vehicle rest positions. Also visible in Figure 3 is the deformation to the left front wheel of the Chevrolet.

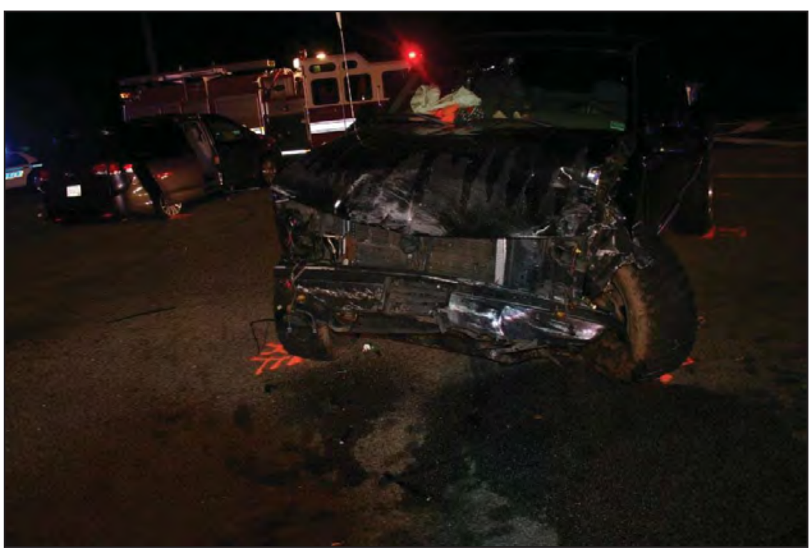

Figure 3 – Accident Area

Figure 4 is a diagram of the scene created by the Georgia Police depicting the layout of the intersecting roadways, the approximate impact configuration and the rest positions of the two vehicles. Kineticorp was also provided with survey data collected by the Georgia Police. Kineticorp incorporated the police measurements in the creation of the computer scene model.

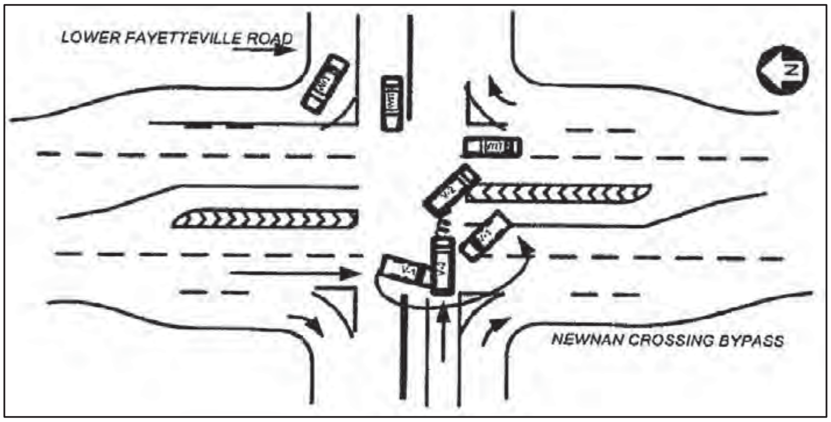

Figure 4 – Police Scene Diagram

Kineticorp inspected, documented, and surveyed the accident site on July 3, 2014. A Sokkia total station with 5-second angular accuracy was used to collect 628 points at the accident site that together defined the geometry of the accident area. The survey included physical evidence still at the scene such as fluid deposits, gouge marks into the roadway surface and remnants of the paint used by police to indicate the tire locations of the vehicles at rest. In addition to the physical evidence, Kineticorp also surveyed the roadway geometry, signs, markers and other unique features of the landscape. Figure 5 contains a scene inspection photograph taken by Kineticorp. This photograph was taken from the northbound turn pocket of Newnan Crossing Bypass, just south of the intersection. Figure 5 shows Kineticorp personnel surveying the crash site with a total station.

Figure 5 – Kineticorp Scene Inspection Photograph

A scaled three dimensional computer model of the scene was created from the survey data. The police scaled diagram and aerial photographs were added and aligned to supplement the model. Kineticorp further supplemented the model with points of rest of the vehicles, fluid marks and yaw marks using photogrammetry.

Photogrammetry

Kineticorp conducted photogrammetric analysis on several provided police photos to locate roadway evidence including tire marks, gouges and areas of fluid and debris. Figure 6 on the next page is a representative series of images from that analysis which demonstrates the photogrammetric process used in this case. The first image (top left) is the original police photograph. In the second image (top right) the scene survey has been aligned with the photograph to create a match. In the third image (middle left) the computer graphic model is added to the survey data. In the fourth image (middle right) roadway physical evidence including tire marks and gouges have been traced and the vehicle models have been added and aligned to the points of rest. The final image (bottom) shows the completed scene model containing all the physical evidence.

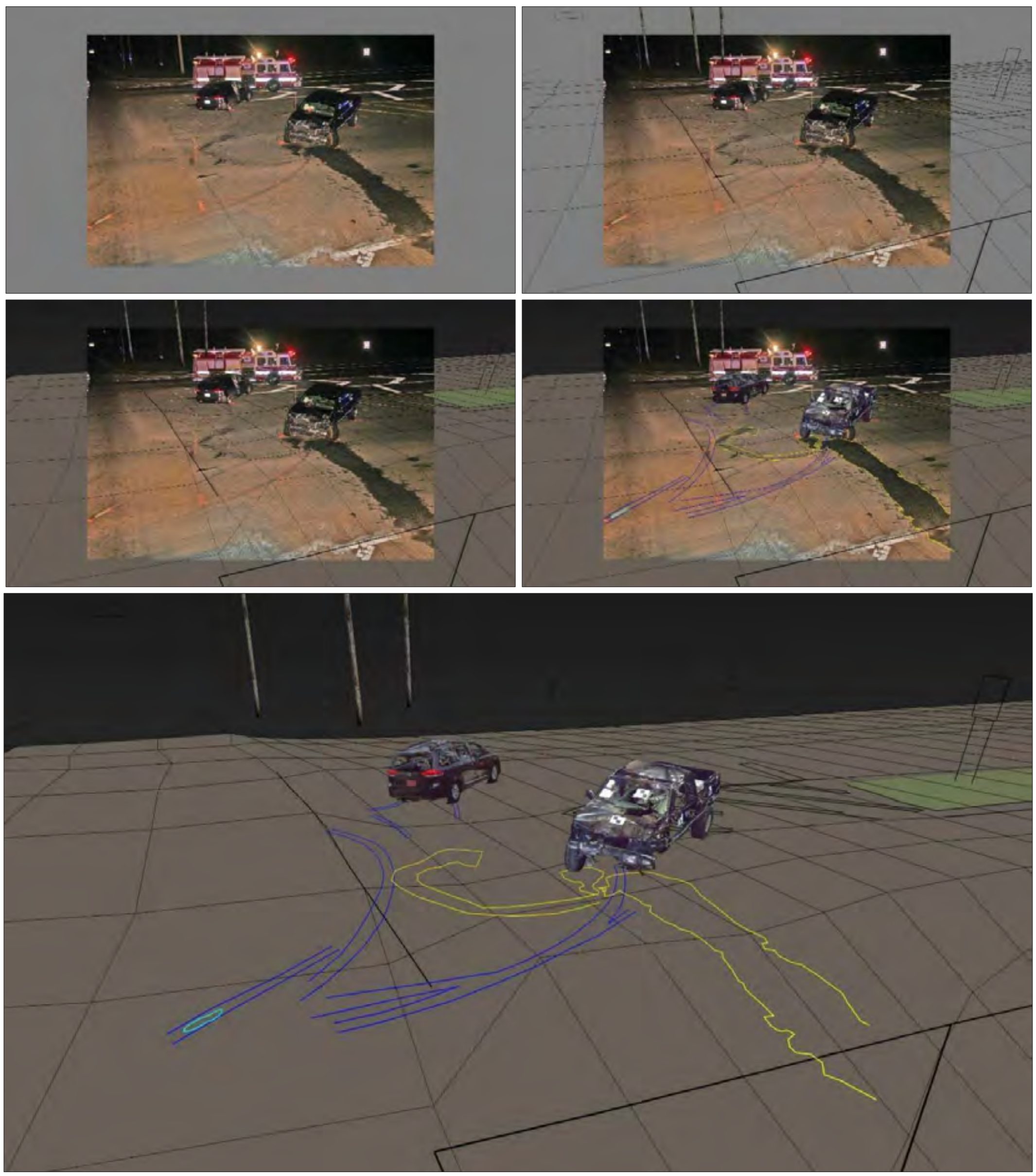

Figure 6 – Photogrammetry

Figure 7 is a graphic containing a top down view of the completed scene model including the points of rest for the two vehicles and the other physical evidence. As seen in Figure 7 the alignment of the roads at the intersection results in an oblique approach angle and the roadways are not oriented along the cardinal directions.

Figure 7 – Scene Diagram

Subject – 2012 Toyota Sienna

Ms. Bacho's vehicle was a 2012 model year Toyota Sienna (VIN – 5TDYK3DC9CS227448). This four-door, two-wheel drive van was equipped with a 3.5-liter, 6-cylinder engine with the XLE trim package. The Sienna was not available to Kineticorp for inspection. Kineticorp determined that the subject Sienna, with the driver and five passengers, weighed approximately 5,275 lbs. at the time of the crash. Figure 8 contains photographs of the Toyota taken by police during an inspection. As can be seen in the figure, the Sienna sustained severe impact damage to the driver's side of the vehicle extending from the driver door and rearward across the B and C pillars. The left rear wheel of the Toyota was engaged during the collision; the wheel rim was fractured, the tire was debeaded and the wheel assembly was deformed inward on the top edge (caster change) and the rear edge of the wheel was rotated inboard (toe change).

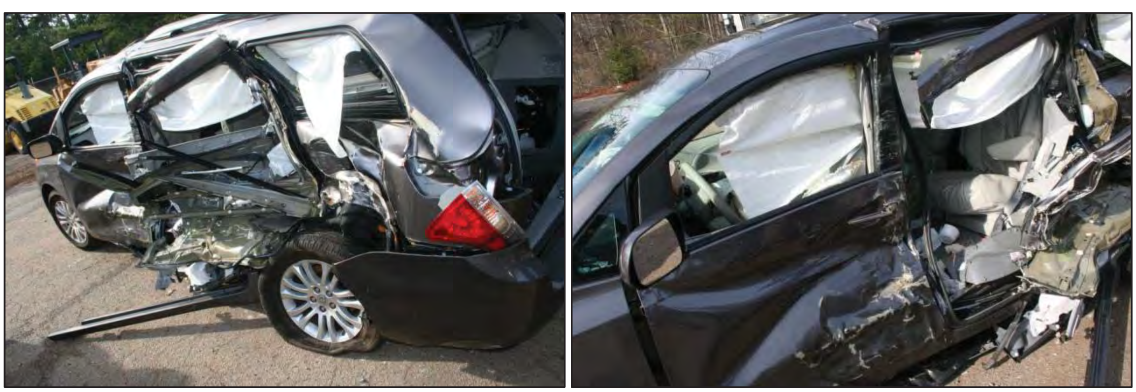

Figure 8 - 2012 Toyota Sienna Exterior

As a result of the crash, the driver's side of the vehicle and occupant compartment of the Toyota Sienna sustained deformation and intrusion. Figure 9 contains photographs of the interior of the Sienna. These photographs show the occupant compartment from the passenger side of the Sienna. As seen in the photos the side and frontal airbags deployed. Inboard deformation can be seen extending from the driver's door across the rear sliding door and into the area just rearward of the C-pillar.

Figure 9 – 2012 Toyota Sienna Interior

The data from the airbag control module from the subject Toyota was imaged by State Trooper Peck on January 2, 2013 and provided to Kineticorp. This data was analyzed within the context of the reconstruction and will be discussed later in the report.

Exemplar – 2012 Toyota Sienna

On July 31, 2014 Kineticorp inspected an exemplar 2012 Toyota Sienna. The vehicle was inspected, photographed, documented and scanned using a Faro Focus 3D scanner. Figure 10 contains photographs taken by Kineticorp during the exemplar vehicle inspection documenting its undamaged geometry.

Figure 10 – Exemplar 2012 Toyota Sienna

Figure 11 contains images depicting the 3D computer model of the vehicle created from the scan data.

Figure 11 – Exemplar 2012 Toyota Sienna Computer Model

Kineticorp conducted photogrammetric analysis on provided inspection photographs of the subject Toyota. The photographs were compared to the exemplar scan data to evaluate the deformation of the Toyota. Figure 12 contains four representative images from the analysis. The images on the left show the exemplar scan model aligned to the photograph. Green points and connecting lines indicate the undamaged locations selected for comparison. The images on the right contain the deformed subject vehicle. The orange lines connect the deformed locations corresponding to the selected green points. The red line connects across the deformed sliding door area. The deformation indicated by this line is only an approximation due to the door removal during extrication and the subject vehicle being unavailable for inspection.

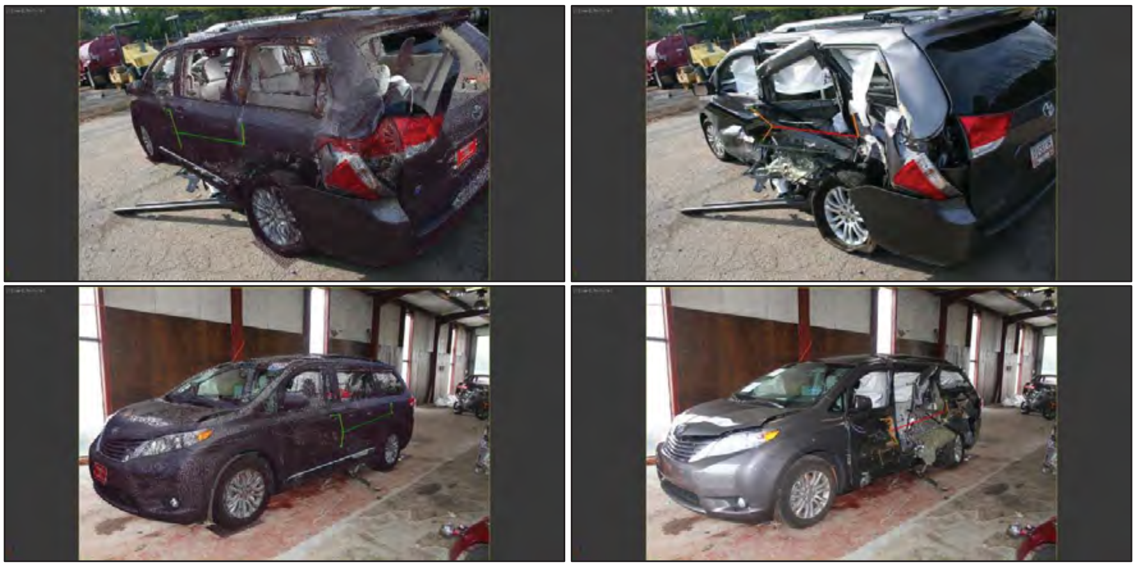

Figure 12 – 2012 Toyota Sienna Damage Photogrammetry

Figure 13 below is a top view of the subject and exemplar vehicles superimposed. Again, green lines represent the undamaged geometry and the red and orange lines indicate the approximate extent of damage caused by the impact of the Chevrolet. The inboard deformation is about 12 inches and the damage width is about 96 inches. These dimensions were used to verify results from the HVE simulation.

Figure 13 – Toyota Damage

Subject – Chevrolet K1500

The pickup involved in this crash was a 1999 model year Chevrolet K1500 (VIN – 1GCEK19R6XR124996). This two-door, extended cab truck was equipped with a 5.7-liter 8-cylinder engine, four-wheel drive, automatic transmission, short bed, and the Z71 trim package. The Chevrolet model designation for this vehicle is K10753. At the time of the accident the Chevrolet was equipped with a 6 inch lift kit manufactured by Rough Country. In addition, the Chevrolet had a set of oversized tires and a set of rear lowering shackles that were not manufactured by Rough Country. Kineticorp determined that this specific K1500, including the Rough Country lift kit, Dick Cepek tires, the driver and cargo, weighed approximately 5,185 lbs. at the time of the crash. Figure 12 contains photographs of the K1500 taken by Kineticorp during an inspection of the vehicle. As seen in figure 12, the subject K1500 has extensive frontal impact damage from the collision with the Toyota Sienna. This damage is heavily biased toward the driver's side of the vehicle. As seen in the photographs, the left front wheel of the Chevrolet was engaged during the crash and broken.

Figure 12 - Subject 1999 Chevrolet Pickup

The photographs in Figure 13 contain two additional inspection photos taken by Kineticorp. The vehicle was inspected, photographed, documented and scanned using a Faro Focus 3D scanner. The left image shows the Faro scanning the subject Chevrolet. As seen in the right image, the passenger airbag deployed and the driver's airbag was not deployed during this crash. Event data from the Airbag Control Module was recovered by Sgt. Keith Addis on December, 27 2012 using the Crash Data Retrieval (CDR) system. A copy of this data report was provided to Kineticorp and utilized in the reconstruction of the incident. The CDR report discussed later in this report indicates that the Supplemental Inflatable Restraint (SIR) warning lamp was illuminated at the time of the crash.

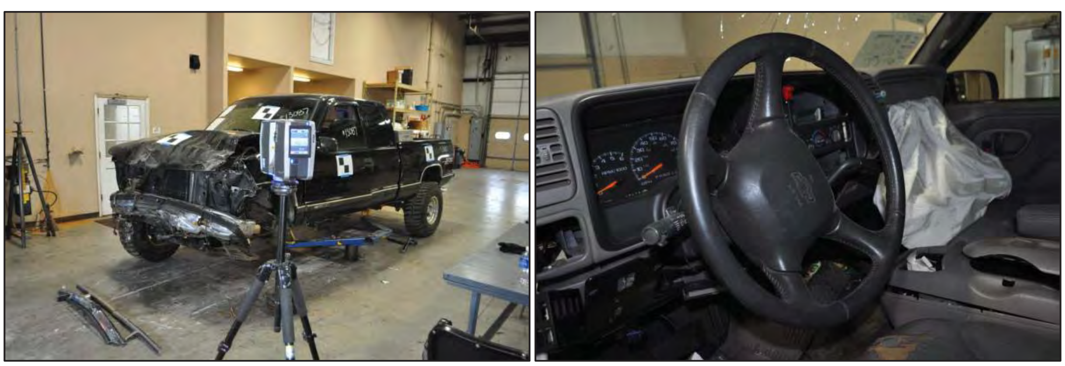

Figure 13 - Subject 1999 Chevrolet Pickup

Figure 14 contains images depicting the 3D computer model of the Chevrolet created from the scanning process.

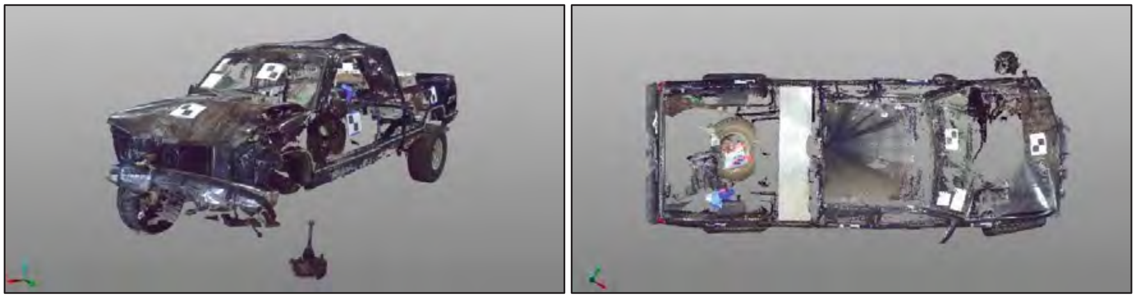

Figure 14 – Subject 1999 Chevrolet Pickup Computer Model

Exemplar – 1998 Chevrolet K1500

On September 15, 2014 Kineticorp inspected an exemplar 1998 Chevrolet K1500. The vehicle was inspected, photographed, documented and scanned using a Faro Focus 3D scanner. Figure 15 contains photographs taken by Kineticorp during the exemplar vehicle inspection documenting its undamaged geometry.

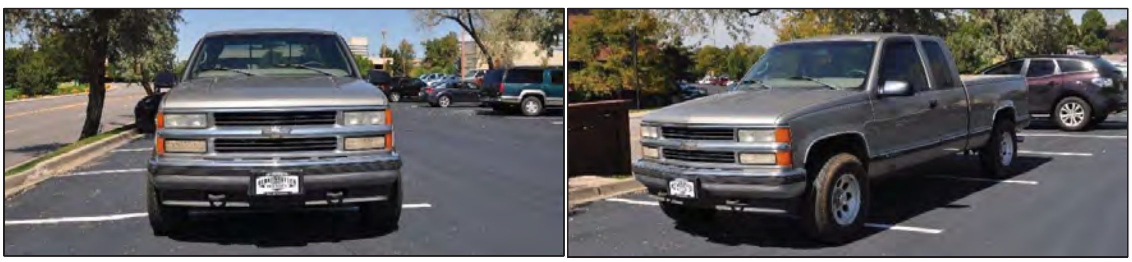

Figure 15 – Exemplar 1998 Chevrolet K1500

Figure 16 contains images depicting the 3D computer model of the exemplar created from the scan data.

Figure 16 – Exemplar 1998 Chevrolet K1500 Computer Model

Kineticorp used the scan data from the subject and exemplar Chevrolet vehicles to determine the extent of damage sustained by the subject Chevrolet. Figure 17 is a top view of the subject vehicle model annotated with two colored lines representing the relative bumper locations and the extent of damage caused by the accident. The green line indicates the location of the undamaged bumper and the red line indicates the location of the subject vehicle bumper.

Figure 17 – Chevrolet K1500 Damage

Physical Evidence Analysis and Accident Sequence Analysis

Based on the reconstruction of the physical evidence on the roadway and the damage patterns sustained by each vehicle, Kineticorp was able to reconstruct the configuration of the vehicles at impact and the motion of the vehicles during the accident sequence to their points of rest. Figure 18 and 19 each contain two top down views of the scene model showing the approximate positions of the vehicles during the accident sequence. Figure 18 shows the vehicles at their point of first contact.

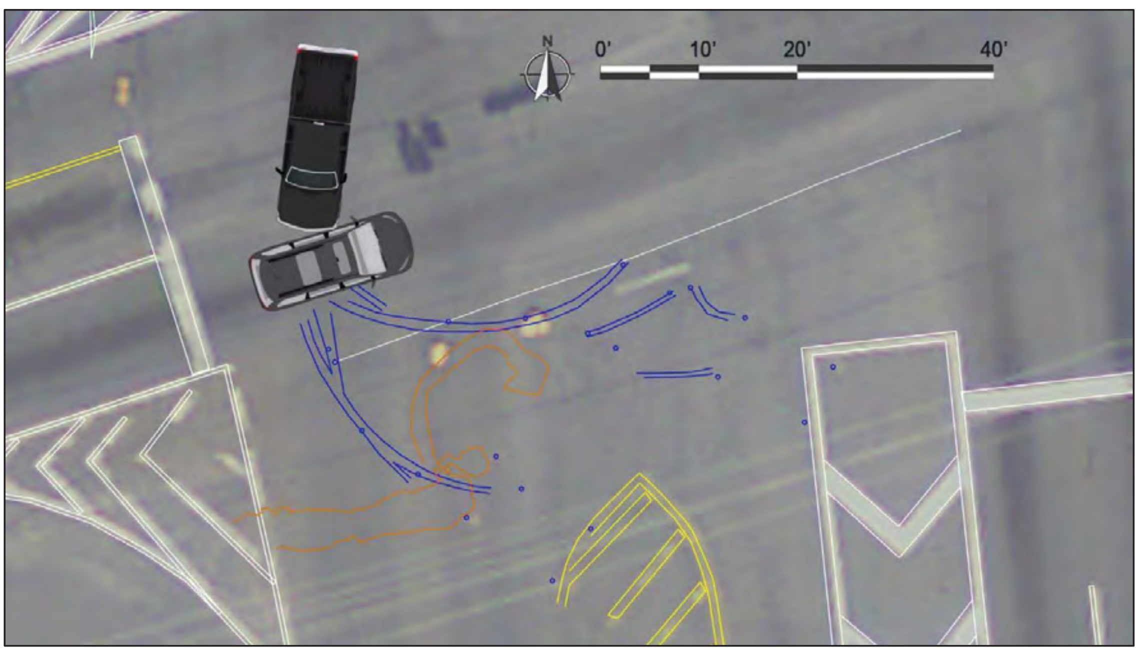

Figure 18 – First Contact Positions

Figure 19 shows the accident sequence including the intermediate positions following the tire mark, gouge and fluid evidence and showing the motion of the vehicles to their known points of rest.

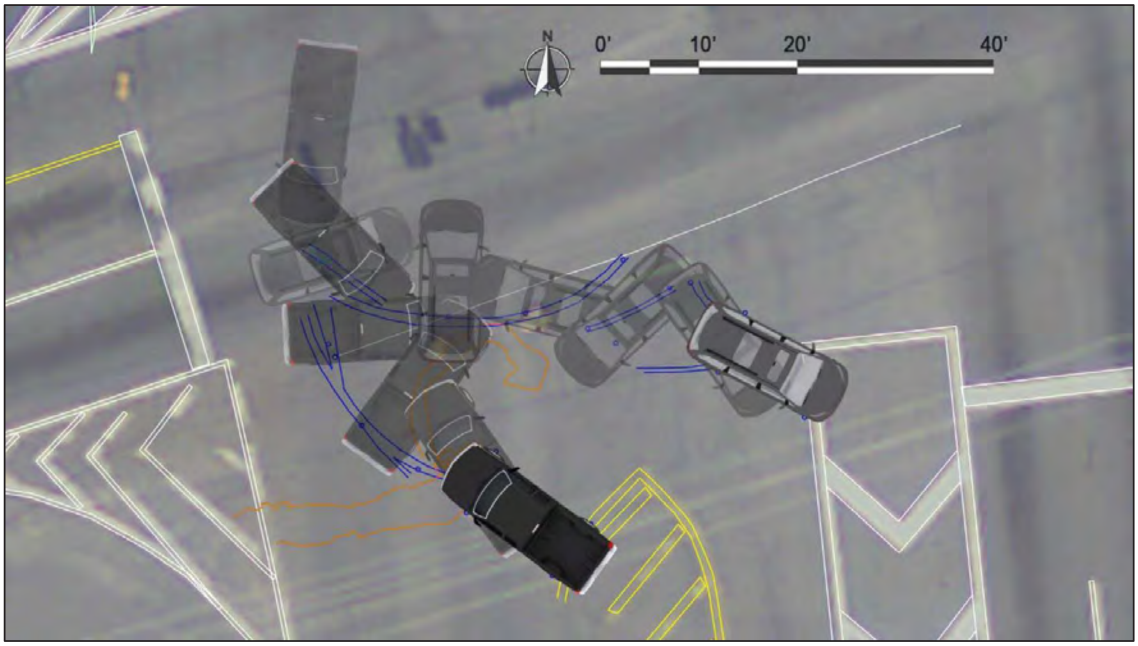

Figure 19 – Accident Sequence

Figure 20 is a graphic depicting the impact configuration between the Toyota and Chevrolet.

Figure 20 – Impact Configuration

Accident Reconstruction

It is widely known in the accident reconstruction community that if two different approaches to a reconstruction are used and the same conclusions are reached, those conclusions are more credible[1]. Kineticorp employed two methodologies when reconstructing this accident. The first approach relies on evidence from the scene and is referred to as Conservation of Energy (CoE) and Conservation of Momentum (CoM) analysis. CoE/CoM analysis is a reliable and standard method commonly used in accident reconstruction. The second approach employed was to simulate the accident using the HVE-3D software package. The HVE-3D analysis incorporated the physical evidence from the scene as well as the vehicle shape, dimensions and physical properties as inputs. By using HVE-3D in this case Kineticorp was able to enhance and refine the CoE/CoM analysis. HVE-3D provides details related to crash pulse, acceleration time series and vehicle damage as well as allowing the testing of what-if scenarios. These two approaches yielded consistent results and are summarized below. In addition, Kineticorp evaluated the data obtained from the vehicle data recorders using the Crash Data Retrieval (CDR) software by Bosch. The data obtained from these devices was also found to be consistent with the two accident reconstruction approaches used by Kineticorp.

Accident Reconstruction - Conservation of Momentum (CoM) / Conservation of Energy (CoE)

Kineticorp used the physical evidence at the scene to determine the speeds of the vehicles at impact and as they traveled to rest. The first step of the process was to determine the vehicle's post impact speed. The post impact speed was calculated using conservation of energy equations. The inputs into the equation were the distances the vehicle's traveled from impact to rest, the effective drag at each wheel and the vehicle's rotation along its travel path. The second step of the process was to determine the vehicle's impact speed. The post impact speed was calculated using conservation of momentum equations. The inputs into the equation were the post impact speeds and the vehicle's orientations before and after impact.

The results from the CoE/CoM analysis are as follows. The Chevrolet, driven by Taylor Long was initially traveling southbound when it failed to stop for the red light and impacted the Toyota on its left side. The Chevrolet's speed at impact was approximately 39 mph. The Chevrolet was redirected to the southeast while rotating approximately 180 degrees counterclockwise. The Chevrolet traveled approximately 42 feet from the area of impact on the roadway to rest near the center median. Kineticorp determined that the left front wheel of the Chevrolet was seriously damaged during the impact. Kineticorp calculated the post-impact speed of the Chevrolet to be approximately 20 mph. The change in velocity experienced by the Chevrolet, as a result of being redirected by the collision, was approximately 21 mph.

The Toyota was initially traveling 35 mph headed northeast. The impact of the Chevrolet caused the Toyota to be redirected to the southeast where it continued to travel approximately 46 feet rotating counterclockwise approximately 360 degrees before coming to rest. The post-impact speed of the Toyota was approximately 26 mph. The Toyota, as a result of the collision experienced a change in velocity of approximately 20 mph.

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[1] Fricke, Lynn B. *Traffic Crash Reconstruction*, 2nd Edition. Evanston, IL: Northwestern University Traffic Institute, 2010.

Accident Reconstruction – HVE-3D Simulation

Kineticorp used HVE-3D to conduct an analysis of the impact and subsequent motion to rest of the two vehicles in this accident. HVE-3D uses physics-based impact and vehicle dynamics models. Kineticorp input vehicle and scene geometry, physical attributes, and driver control inputs. The resulting simulation followed the roadway evidence and resulted in close agreement with the known orientation and points of rest of the two vehicles. Our simulations utilized inputs for the vehicles, the roadway, the steering, acceleration, and braking control inputs by each driver that were physically realistic, reasonable and justified by the available technical literature of accident reconstruction. Figure 21 is a series of top down view images showing the progression of the vehicles in the accident simulation from impact to rest.

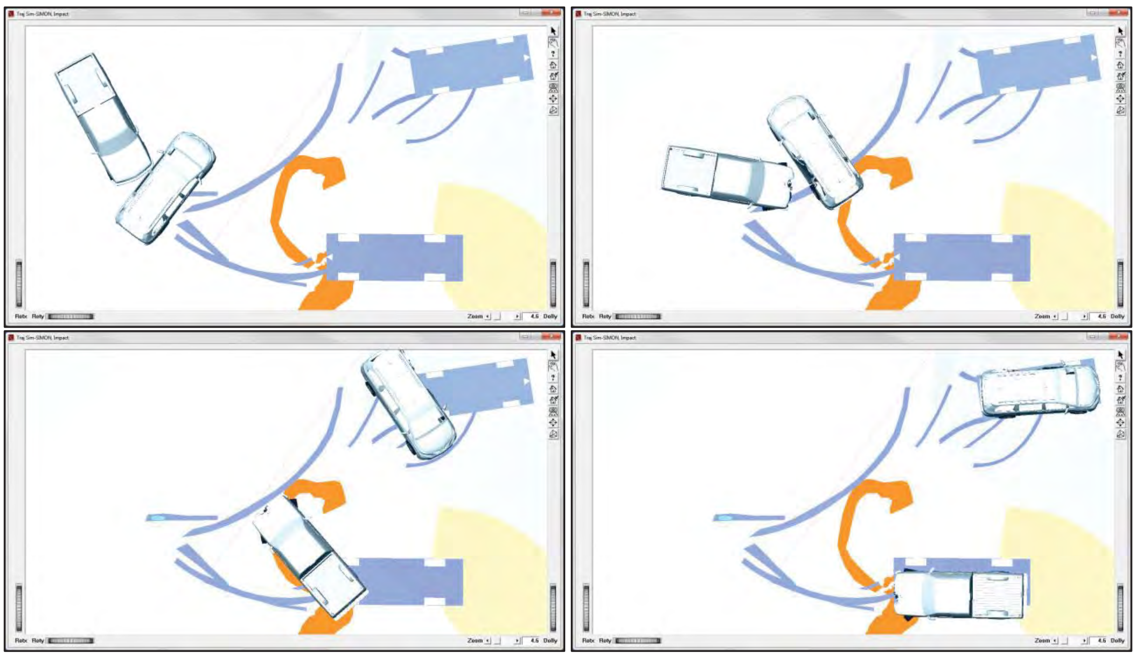


Figure 21 – HVE-3D Simulation Sequence

Based on the HVE-3D analysis Kineticorp obtained the results listed in Table 1 below.

	Chevrolet K1500 Pickup	Toyota Sienna
Impact Speed (mph)	38	35
Speed Change (ΔV) (mph)	23	22 - 23
Post Impact Rotation Rate (deg/sec)	80	114
Principal Direction of Force (PDOF) (deg)	26	41

Table 1 – HVE Simulation Results

Kineticorp used the HVE-3D simulation to determine the accelerations that were experienced at the seating location of Abigail Bacho. The principal direction of force for the Toyota was oriented at approximately 10 o'clock relative to the vehicle with clockwise post-impact rotation on the order of 114 degrees per second. The post-impact rotation increased the accelerations experienced by the occupants in the rear of the vehicle. The accelerations experienced by Abigail Bacho, seated in the third row left side position, were about twice those experienced by the vehicle as a whole. Abigail Bacho experienced accelerations of

approximately 42 times gravity during the impact[2]. Figure 22 is a plot of the total acceleration experienced during the first 100 milliseconds in the HVE simulation for the vehicle's center of gravity and the third row left seated position.

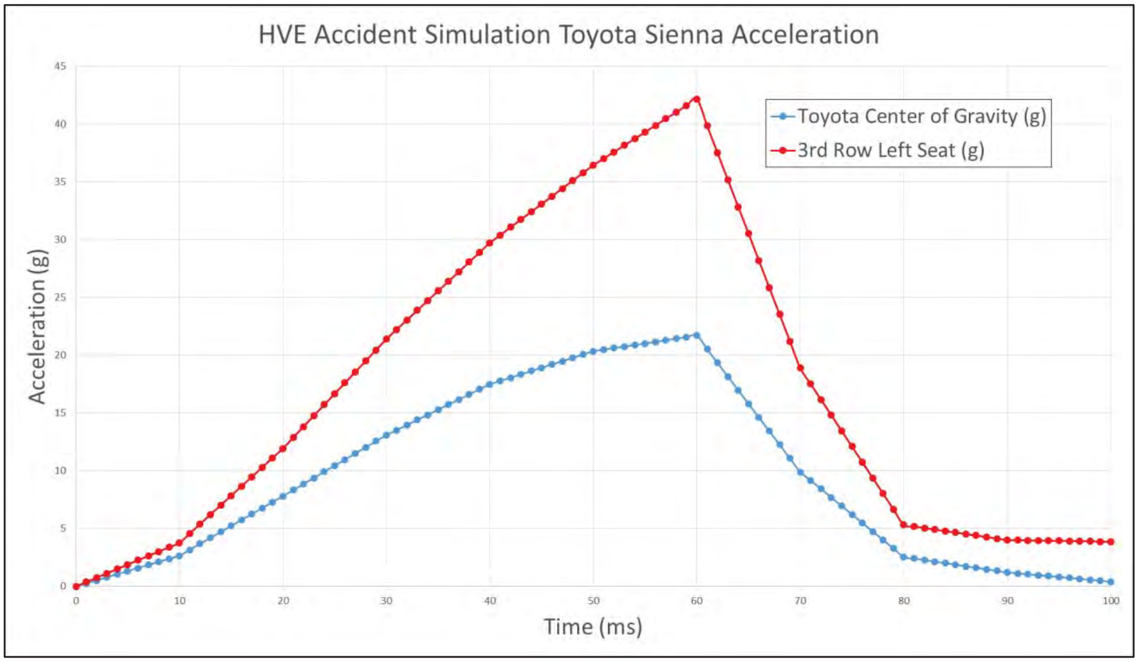
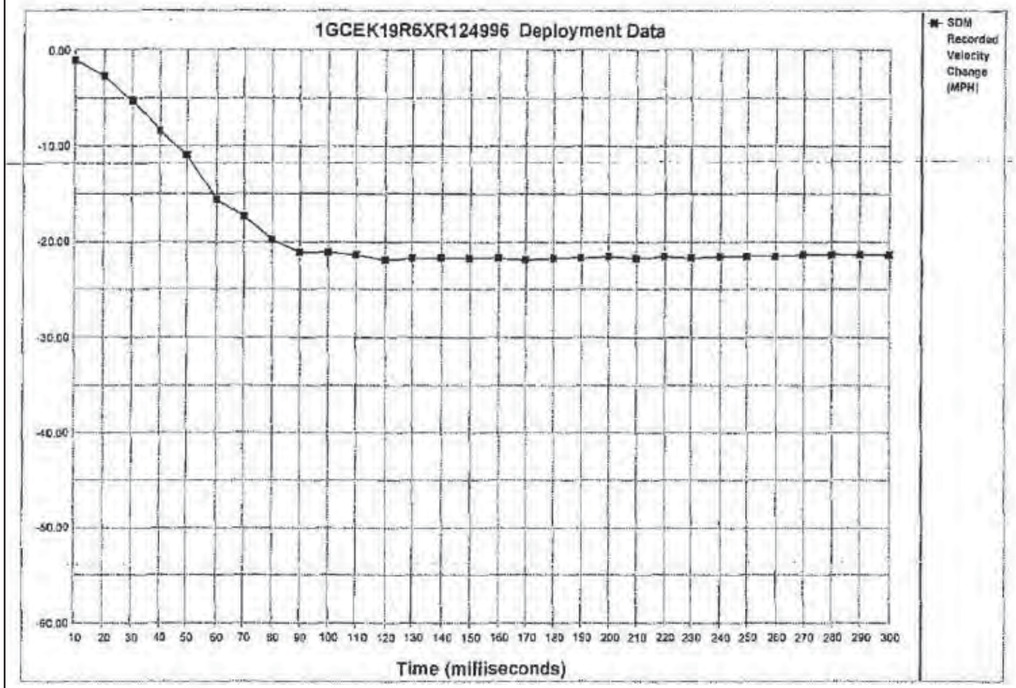


Figure 21 – HVE-3D Accident Acceleration Plots

[2] Fay, Richard J., et al., "The Effect of Vehicle Rotation on Occupant's Delta V," SAE Technical Paper 960649. Warrendale: Society of Automotive Engineers, 1996.

Accident Reconstruction – Electronic Data Recorders (EDRs)

The 1999 Chevrolet K1500 was equipped with an Airbag Control Module (ACM) capable of recording data related to the deployment of airbags as a result of the crash. Table 2 displays the crash pulse and the recorded velocity change in miles per hour. The maximum change in velocity, or delta-V, experienced by the K1500 is 21.94 mph at 120 milliseconds although the delta-V plateaus around 100 milliseconds.



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-1.10	-2.63	-5.27	-8.34	-10.97	-15.58	-17.33	-19.75	-21.06	-21.06	-21.28	-21.94	-21.72	-21.72	-21.72
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Recorded Velocity Change (MPH)	-21.72	-21.94	-21.72	-21.72	-21.50	-21.72	-21.50	-21.72	-21.50	-21.50	-21.50	-21.28	-21.28	-21.28	-21.28

Table 2 – Chevrolet ACM Deployment Data

Table 3 contains data related to the system status at the time of deployment. Two statuses have been highlighted in Table 3. The Supplemental Inflatable Restraint, SIR, warning status is ON indicating there is a malfunction in the system. Also, it is indicated that the driver's belt status is UNBUCKLED.

System Status At Deployment	
SIR Warning Lamp Status	ON
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger SIR Suppression Switch Circuit Status (if equipped)	Air Bag Not Suppressed
Ignition Cycles At Deployment	25684
Ignition Cycles At Investigation	25690
Time From Algorithm Enable To Deployment Command (msec)	15
Time Between Non-Deployment And Deployment Events (sec)	N/A

Table 3 – Chevrolet ACM System Status

Table 4 contains pre-crash data from the Sienna including vehicle speed, brake usage, accelerator pedal position and engine rpm. This data is recorded by the ACM every second. The farthest right column contains the last data elements recorded by the ACM prior to impact. This data shows that just before impact, the Sienna was traveling at 34.8 mph, the accelerator was being applied and there was no use of the brakes prior to impact.

Pre-Crash Data, -5 to 0 seconds (Most Recent Event, TRG 1)

Time (sec)	-4.3	-3.3	-2.3	-1.3	-0.3	0 (TRG)
Vehicle Speed (MPH [km/h])	36 [58]	36 [58]	34.8 [56]	34.8 [56]	34.8 [56]	34.8 [56]
Brake Switch	OFF	OFF	OFF	OFF	OFF	OFF
Accelerator Rate (V)	1.09	1.09	0.78	1.17	0.94	0.94
Engine RPM (RPM)	1,200	1,200	1,200	1,200	1,200	1,200

Table 4 – Toyota RCM Pre-Crash Data

At the beginning of the Crash Data Retrieval report, there is a section entitled "Data Limitations" that serves to inform the analyst about known anomalies and limitations of the data contained in the report. On page 2 of the report from the Toyota, the following information is presented:

- The upper limit for the recorded "Vehicle Speed" value is 122 km/h (75.8mph). Resolution is 2km/h (1.2mph) and the value is rounded down and recorded. The accuracy of the "Vehicle Speed" value can be affected by various factors. These include, but not limited, to the following.
  - Significant changes in the tire's rolling radius
  - Wheel lock and wheel slip

Noting that the vehicle limitations section of the CDR report states that the resolution of the reported vehicle speed is rounded down and recorded, Kineticorp has determined, that prior to impact with the Chevrolet, the Toyota was originally traveling between 34.8 to 36 mph.

The event data from the Chevrolet revealed:

- The Chevrolet experienced a longitudinal speed change of 22 mph.
- The Chevrolet driver was unbuckled and the SRS warning lamp was illuminated.

The event data from the Toyota revealed:

- The Toyota was travelling between 34.8 and 36 mph for 3 seconds up to and including the impact.
- The driver of the Toyota was pressing the accelerator and did not brake prior to impact.

Accident Reconstruction – Summary

The two independent methods used by Kineticorp in this case yielded nearly identical results. The Conservation of Energy and Conservation of Momentum (CoE/CoM) and HVE-3D simulation results are shown in Table 5 below as well as corresponding values from the vehicle data recorders obtained by the Crash Data Retrieval (CDR) system.

	CoE / CoM	HVE-3D	CDR
Crash Pulse Duration (ms)		~90	~90
Chevrolet K1500 Pickup			
Impact Speed (mph)	~39	38	Not Reported
Speed Change (ΔV) (mph)	~21	23	21.94 (Peak)
PDOF (deg)	~-40	-40.5	Not Reported
Toyota Sienna			
Impact Speed (mph)	~36	35	34.8 (to 36)
Speed Change (ΔV) (mph)	~20	22 - 23	Not Reported
PDOF (deg)	~26	26.3	Not Reported

Table 5 – Analysis Results Summary

Brake testing

Plaintiffs have alleged that the subject vehicle's braking capability was significantly diminished due to the lift kit modification. Kineticorp investigated this claim by testing an exemplar Chevrolet. The exemplar Chevrolet K1500 was evaluated under three conditions. In the first condition the vehicle was at its stock height with the stock tires installed. In the second condition the vehicle had the 6" Rough Country lift kit and the stock tires installed. In the third condition the vehicle had the 6" Rough country lift kit, Dick Cepek Crusher tires and the rear lowering shackles installed in the same configuration as the accident vehicle. In each configuration the vehicle was equipped with a VBOX data collection device that uses high precision Global Positioning Satellite (GPS) data to assess the velocity and acceleration of the vehicle during locked wheel braking. In each case the weather was clear, the temperature was moderate and the pavement surface was dry and flat. All testing was completed on the same unused portion of roadway. For each testing run the vehicle was traveling approximately 35 to 40 mph and maximum braking was applied until the vehicle came to a stop. Four deceleration runs were completed in each configuration and the deceleration averages were computed for each condition. The results are shown in Table 6 below. Kineticorp did not see a significant difference in braking effectiveness due to the installed lift kit or tires.

Condition	Acceleration
Stock Height, Stock Tires	-0.76
6" Lift Kit Installed, Stock Tires	-0.76
6" Lift Kit Installed, Large Tires	-0.73

Table 6 – Chevrolet Acceleration Data

Comparison to NHTSA NCAP testing

Kineticorp compared the vehicle damage experienced in the subject accident to the National Highway Traffic Safety Administration (NHTSA) New Car Assessment Program (NCAP) side impact test (number 6944). Figure 22 below shows a pair of images comparing damage of the subject vehicle on the left to the damage of the NCAP test vehicle on the right. As seen in the photos, indicated by the vertical dotted yellow lines, the NCAP test vehicle had significantly less damage width than the accident vehicle. The damage width for the NCAP test was about 94 inches while the damage width on the accident vehicle was about 116 inches. The maximum crush depth measured in the NCAP test was 9.8 inches while the accident vehicle showed at least 12 inches of crush.

Figure 22 – Damage Comparison: Subject Vehicle (Left) vs. NCAP Test Vehicle (Right)

Figure 23 contains a graphic depicting damage to the subject vehicle on the left compared to a top view photograph of the test vehicle on the right. As seen in Figure 23, the damage to the side of the subject vehicle extends inboard much further than the damage seen on the test vehicle.

Figure 23 – Damage Comparison: Subject Vehicle (Left) vs. NCAP Test Vehicle (Right)

The impact angles and relative speeds of the vehicles were significantly different between the subject accident and the NCAP test. The accident impact began with contact to the driver's door and b-pillar that caused the left front corner of the Chevrolet to be deformed rearward. The relative motion of the vehicles caused both to rotate counterclockwise. As the contact continued the front of the Chevrolet rolled across the side of the Toyota toward the area of the C-pillar. This contact and rotation caused a significant rearward speed change for the Toyota which likely led to a deployment of the frontal airbags. Figure 24 contains interior views of the subject and NCAP test vehicles. As seen in the photos the NCAP test did not cause a frontal airbag deployment.

Figure 24 – Interior Comparison: Subject Vehicle (Left) vs. NCAP Test Vehicle (Right)

The differences in crush depth and width are directly related to differences in impact energy. The NCAP test involves a 38.4 mph crabbed Moving Deformable Barrier (MDB) impact into a stationary vehicle. The barrier weighs approximately 3000 lbs. The subject accident involved a 5,185 pound impacting vehicle with a closing speed of at least 39 mph. With similar speeds the difference in energy is predominantly due to the weight difference of the impacting vehicles. Neglecting the lateral speed component of the Toyota in the subject accident the impact energy is conservatively 73 percent greater than the comparable NCAP test.

Bumper Height Comparison - High Profile Vehicles

As drivers travel public roadways, they frequently encounter numerous high profile vehicles. These high profile vehicles include sport utility vehicles and pickup trucks designed to accommodate off-road driving, mass transit vehicles and commercial vehicles designed for use in various applications. Kineticorp engineers have reconstructed numerous accidents involving high profile vehicles. Figure 25 below contains a sample of images based on the computer models from Kineticorp inspections of these vehicles.

Figure 25 – High Profile Vehicles

Figure 26 compares the bumper height from the vehicles shown in Figure 25 to the geometry of the vehicles involved in this crash. As shown in the graphic, the bumper of the lifted Chevrolet pickup truck falls within the range of bumper heights of other vehicles one might encounter on public roadways.

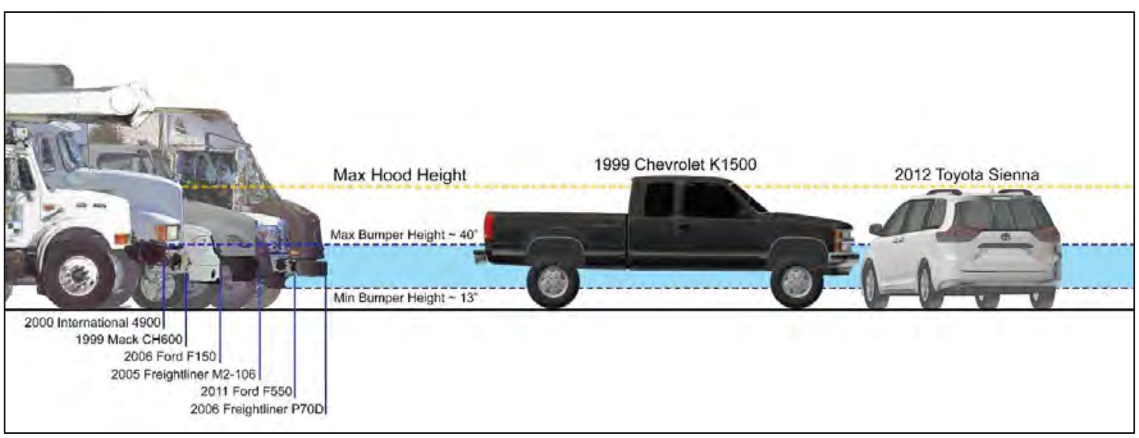


Figure 26 – Bumper Height Comparison

Review of Expert Report and Testimony of Dr. David Renfroe

Kineticorp has reviewed the expert report from Dr. David Renfroe. Kineticorp has many criticisms of Dr. Renfroe's opinions and methodologies, several of which are described below.

Accident Reconstruction: On page 29 of his report, Dr. Renfroe summarized his reconstruction of the accident using the PC-Crash simulation program. Dr. Renfroe's simulation resulted in the Chevrolet experiencing a ∆V of approximately 17 mph. However, the subject Chevrolet was equipped with accelerometers integrated into the airbag system that sensed and recorded the accelerations experienced by the Chevrolet during the subject crash. This data was recovered by the Crash Data Retrieval (CDR) software and reported a maximum velocity change for the Chevrolet of approximately 22 mph. Dr. Renfroe reported that this data was among the materials he received (page 7 of his report) and on pages 57 and 58 of his deposition Dr. Renfroe states that he matched his reconstruction to the CDR data from the accident. Dr. Renfroe's PC-Crash simulation underestimated the speed change experienced by the Chevrolet by 5 mph, or 23%, when compared to the accelerometer data recorded by the subject vehicle. Numerous studies have been published pertaining to the accuracy of this accelerometer data for use in accident reconstruction. One such study[3], authored by researchers from the National Highway Traffic Safety Administration, examined the accuracy of model year 1998 General Motors cars, SUVs and pickup trucks similar to the subject Chevrolet pickup truck. Figure 27 is a figure from this study. As seen in the figure, the laboratory ∆V (labeled 'elec data') is plotted in blue and the data from the event data recorder (labeled 'edr data') is plotted as black data points. This study found that the data from the airbag accelerometers generally corresponded to laboratory instrumentation, however the EDR data from the airbag accelerometers was slightly lower that the laboratory instrumentation, as seen in the figure.

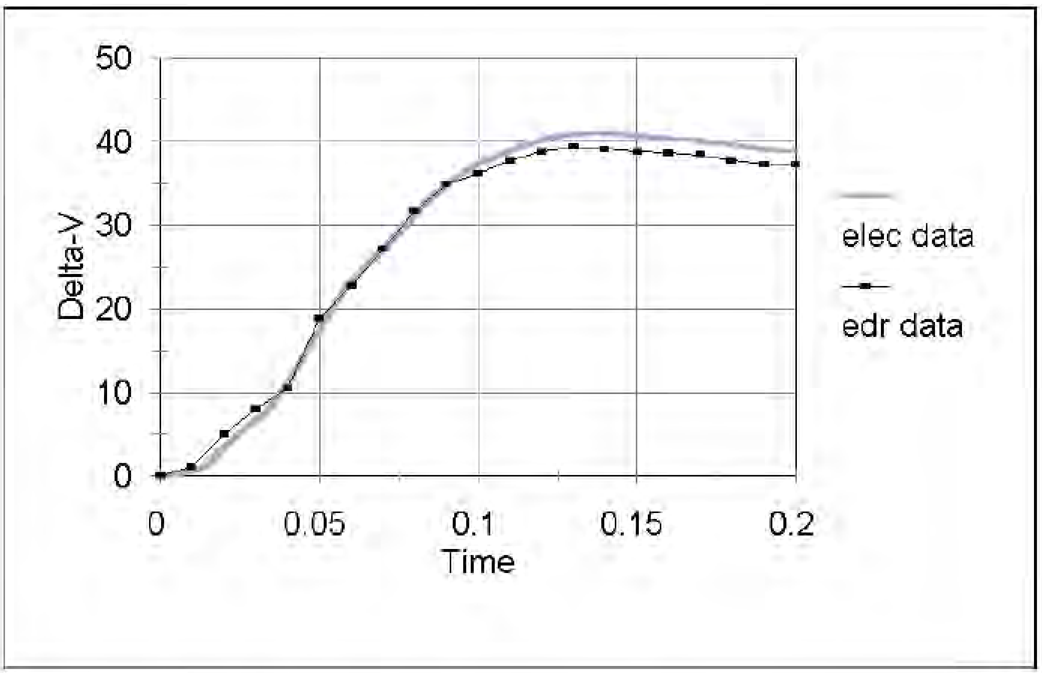


Figure 27 – Published Validation of General Motors Event Data Recorders

[3] Chidester, Augustus "Chip" B., et al. "Real World Experience with Event Data Recorders," Paper Number 247. National Highway Traffic Safety Administration, 2001.

This testing shows that the Chevrolet ΔV of approximately 22 mph would be slightly lower than the actual ΔV from the crash. Dr. Renfroe's analysis is opposite of these findings, the ΔV reported by the CDR system is 23% higher than the results of Dr. Renfroe's PC-Crash simulation.

Kineticorp has reviewed the output from Dr. Renfroe's PC-Crash simulation, which is shown below in Figure 28. The image on the left of the figure is the original PC-Crash output and the image on the right contains a blue dotted line that represents the rest position of the Toyota and the red dotted line represents the rest position of the Chevrolet. As seen in the diagram, the PC-Crash simulation does not match the physical evidence, specifically orientations of both vehicles at their points of rest. As a result, the simulation underestimates the post-impact rotational movement of both vehicles. Kineticorp believes that the simulation underreports the energy of the subject accident and explains why the ΔVs from the simulation are approximately 23% less than the ΔV from analysis the airbag accelerometer data.

Figure 28 – Dr. Renfroe's PC-Crash Simulation

Page 39 of Dr. Renfroe's report contains graphics depicting the interaction between the two vehicles in this crash. Figure 29 contains a photograph of the front of the Chevrolet and Dr. Renfroe's graphics. As seen in Dr. Renfroe's graphics, the impacting Chevrolet is depicted in an undamaged state. The Chevrolet experienced over 12 inches of rearward crush deformation on its left side as a result of the impact. The damage can be seen clearly in the photograph. By depicting an undamaged Chevrolet, Dr. Renfroe is graphically demonstrating a scenario that is not representative of the physical evidence. This graphic is inaccurate and misleading when illustrating the intrusion of the Chevrolet into the Toyota. Additionally, Dr. Renfroe's graphic does not depict any deformation to interior panels of the Toyota, making this graphic inconsistent with Result #3 from page 43 of his report.

Figure 29 – Dr. Renfroe's Intrusion Graphic

Vehicle Compatibility: Figure 30 is a figure from Dr. Renfroe's report. In this figure, a computer model of the driver's side of the Toyota is shown, along with a blue shaded rectangle that represents the area of the Toyota that would be struck by the bumper of a stock Chevrolet in a side impact. In his report, Dr. Renfroe argues that the engagement between the bumper of the Chevrolet and the rear wheel of the Toyota would prevent intrusion into the side of the Toyota. During his deposition (page 76), Dr Renfroe testified that the area of the Toyota wheel engaged by the bumper of the un-lifted stock Chevrolet pickup was 25%. His drawing below shows the area he claims is 25%, colored in green. Red lines have also been added to Dr. Renfroe's graphic to divide the wheel into quarters. Kineticorp took measurements from Dr. Renfroe's computer model and determined that the area of the Toyota wheel is approximately 270 square-inches. The area where the Chevrolet bumper would contact the wheel is less than 21 square-inches amounting to less than 8% of the total area of the wheel. Kineticorp does not believe that this minimal contact between the Chevrolet bumper and a small portion of the aluminum alloy left rear wheel of the Toyota would prevent or even significantly change the intrusion into the side structure of the Toyota.

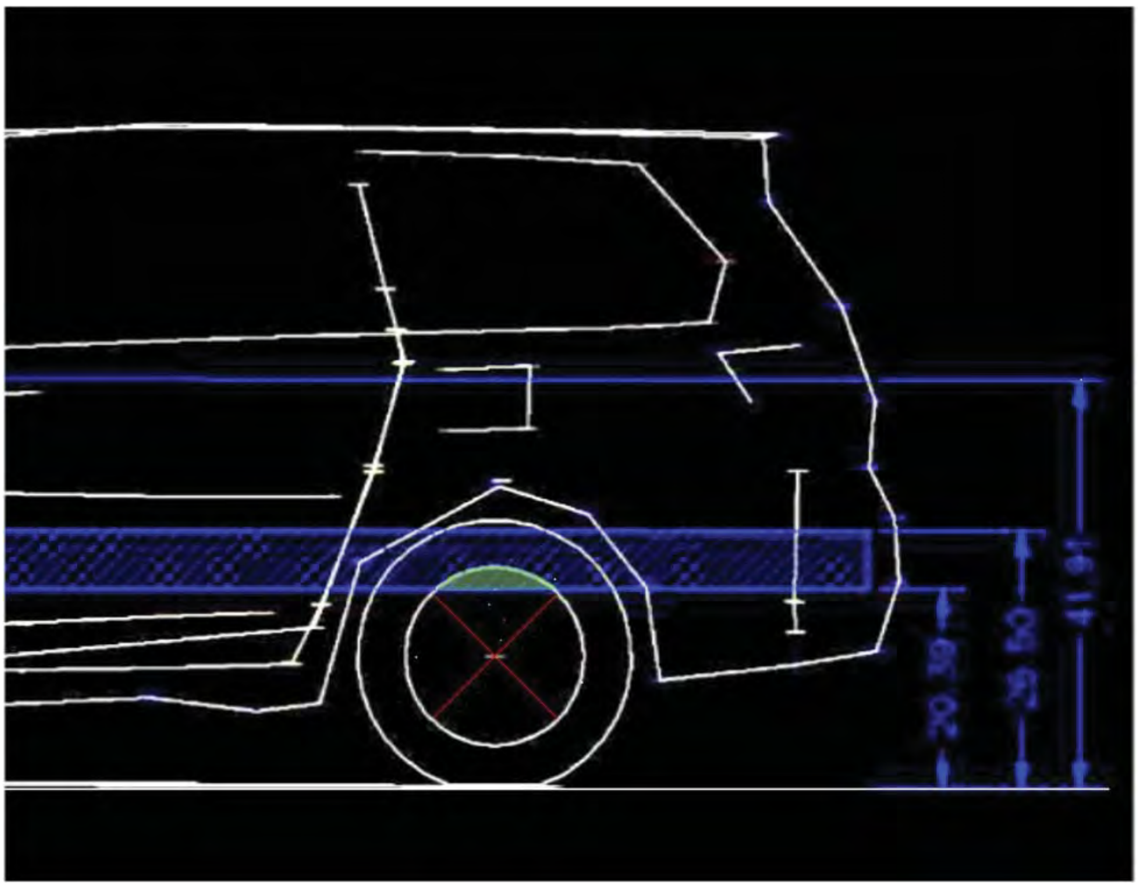


Figure 30 – Dr. Renfroe's Figure Representing Vehicle Compatibility

To support his allegation that engagement between the bumper of the Chevrolet and the wheel of the Toyota would prevent intrusion into the Toyota, Dr. Renfroe opines that the rear drive axle and differential of the Toyota would stiffen and provide structural reinforcement to the wheel during an impact (deposition pages 84-85). The Bacho Toyota was not an all-wheel drive model and was not equipped with a rear drive axle or rear differential. According to the Toyota inventory vehicle detail sheet obtained by Kineticorp, the Bacho Toyota Sienna was the two-wheel, front-wheel drive (FWD) model. The exemplar Toyota Sienna inspected by Dr. Renfroe and his staff was also the front-wheel drive model. Figure 31 below contains photographs from Dr. Renfroe's file and clearly shows no rear drive axle or differential in the rear of the Toyota. Dr. Renfroe's opinion that the rear axle and differential would stiffen the rear wheel of the Toyota does not apply to this crash.

Figure 31 – Dr. Renfroe's Exemplar FWD Toyota Sienna Photographs

On pages 90 and 91 of his deposition, Dr. Renfroe testified that he has not seen a side impact where there was a contact at the wheel where there was intrusion into the occupant space. Kineticorp engineers have reconstructed thousands of vehicle accidents, many of which were vehicle-to-vehicle crashes. Kineticorp routinely reconstructs side impacts in which a wheel of the struck vehicle was engaged, deformed and/or broken, and the struck vehicle experienced significant intrusion. Of these crashes, some involved impacts into the left rear wheel of mini-vans in which that wheel was broken from the vehicle and the minivan experienced intrusion into the rear occupant compartment of the vehicle. Figures 32a – 32e below contain examples of these crashes.

Figure 32a – Side Impact: 1990 Ford Taurus & 1999 Ford Mustang
(Smith County, TX – 3/13/2004)

Figure 32b – Side Impact: 2003 Jeep Liberty & 1999 Pontiac Grand Am (Ennis, TX – 6/17/2004)

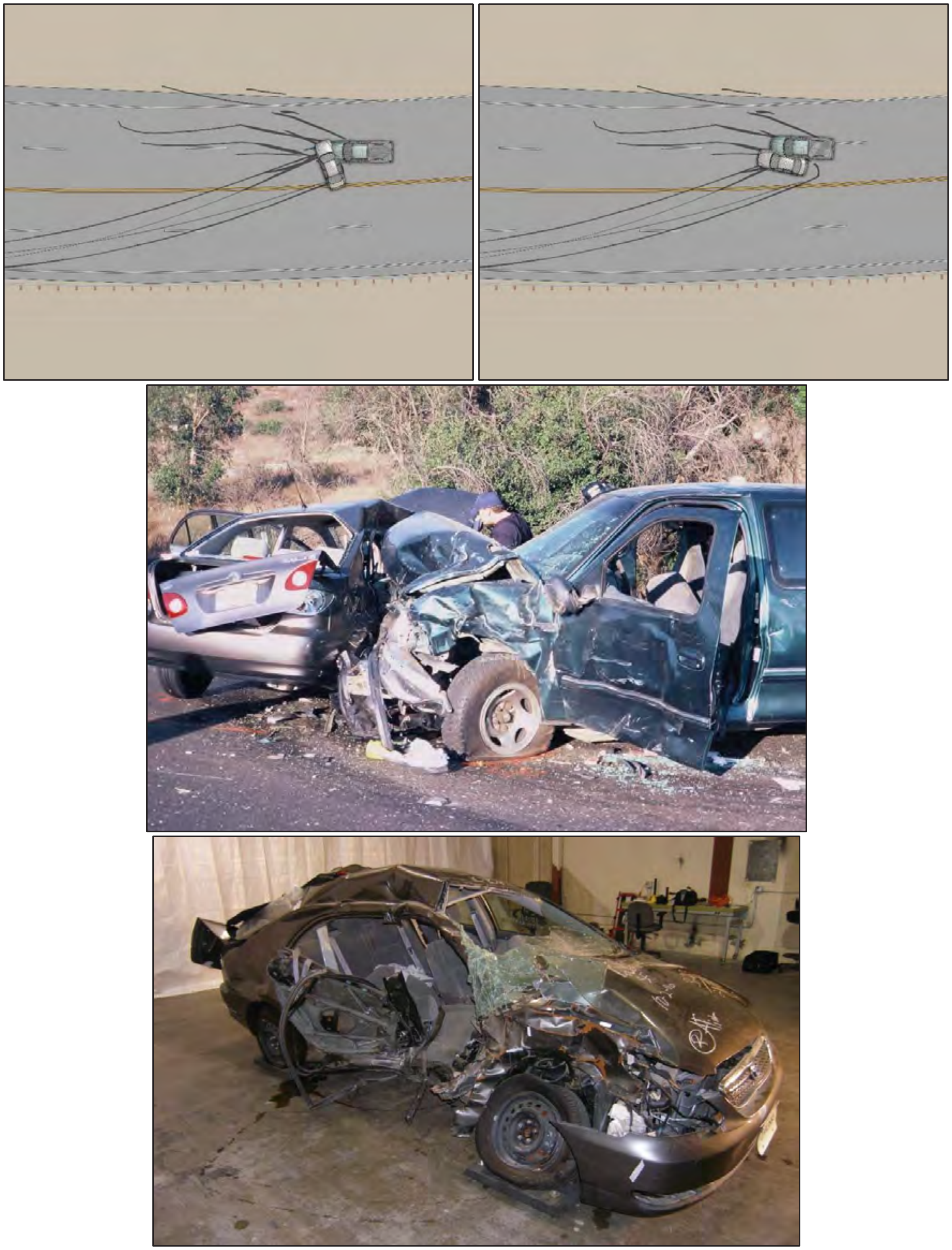


Figure 32c – Side Impact: 1997 Ford F-150 & 2007 Toyota Corolla (El Cajon, CA – 9/7/2007)

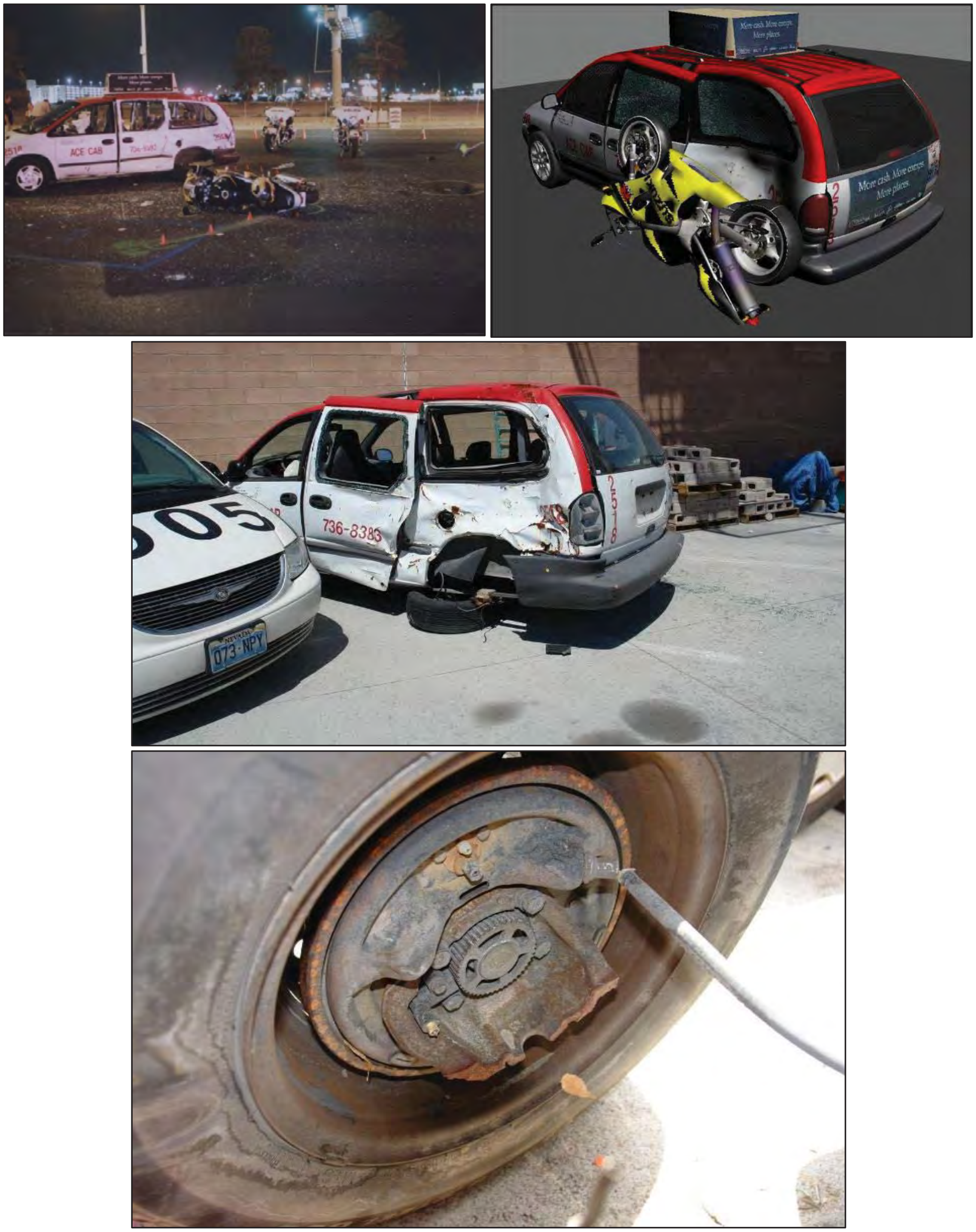


Figure 32d – Side Impact: 2002 Suzuki GSX-R600 & 2000 Plymouth Grand Voyager (Las Vegas, NV – 5/31/2003)

Figure 32e – Side Impact: 2007 Hummer H3 & 1993 Mercury Villager (Calaveras County, CA – 10/18/2008)

Crash Test Analysis: Pages 31 through 34 of Dr. Renfroe's report contains a discussion comparing two New Car Assessment Program (NCAP) side impact tests. These tests pertain to a 2014 ½ model year Toyota Camry (test # 8560) and a 2013 Smart Electric 2 Door Coupe (test # 8312). Figure 33 below contains photographs from the respective crash test reports, the same photographs from page 33 of Dr. Renfroe's report.

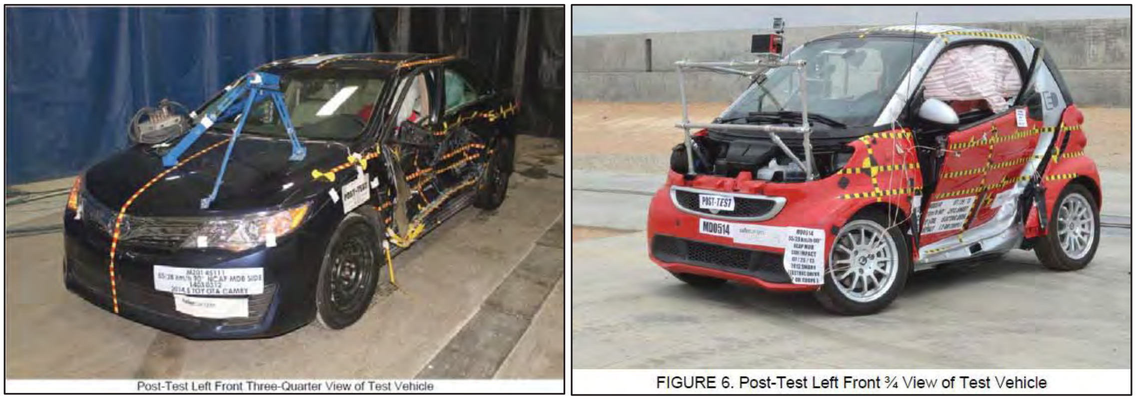


Figure 33 – NCAP Side Impact Test Photographs: Toyota (left) and Smart Car (right)

Dr. Renfroe uses these crash tests to illustrate that impacts involving wheels reduce intrusion. What Dr. Renfroe does not acknowledge is that when vehicles deform, their structures absorb energy during a crash, reducing the accelerations experienced by the occupants. In the NCAP crash tests, the accelerations experienced by the dummies were measured. Figure 34 below is a series of data plots measuring the resultant head accelerations for each test. The first image in the graphic shows the dummy head acceleration from the Toyota test, the second image in the graphic shows the dummy head acceleration from the Smart Car test. The image below is a combination of both plots. As seen in the figure, the peak head acceleration in the Toyota crash test was 31.7 G's. The peak head acceleration in the Smart Car crash test was 51.7 G's, 20 G's (63%) more than the Toyota test. The crash pulse duration from the Smart Car test was also significantly shorter than the Toyota crash pulse. Dr. Renfroe implies that a reduction in intrusion results in increased occupant safety, however Dr. Renfroe neglects to consider the effects of energy management as the vehicle crumples and absorbs energy. As shown above, making a vehicle stiffer can substantially increase the accelerations acting on the vehicle's occupants.

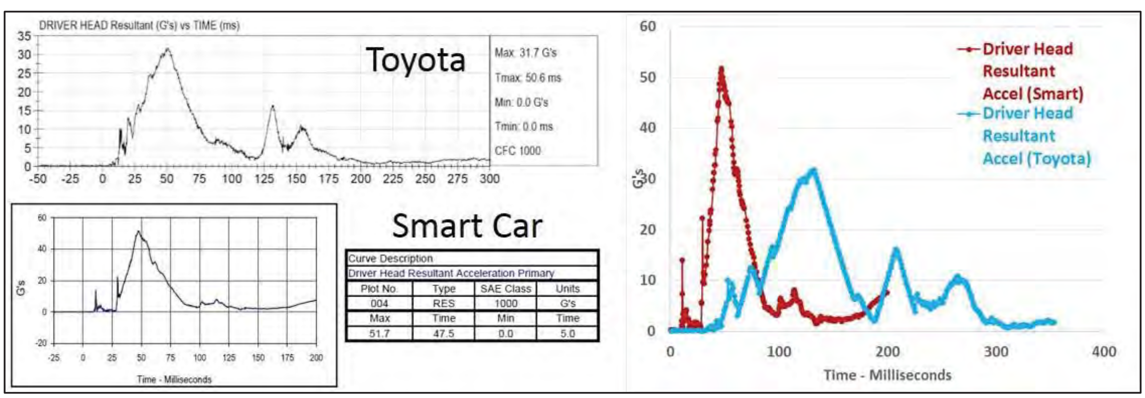


Figure 34 – NCAP Side Impact Test: Resultant Head Acceleration

It appears that Dr. Renfroe is of the opinion that had the lift kit not been installed on the subject Chevrolet, there would have been little to no intrusion into the third row occupant space. This opinion appears to be based on his belief that the Toyota's rear left wheel would have been stiff enough to prevent intrusion, with which Kineticorp disagrees. However, if we are to believe Dr. Renfroe's opinion that the rear left wheel would be stiff enough to prevent intrusion, then the accelerations acting on the occupants would likely be

substantially greater. To quantify the effects on the occupant in the third row left seat position, Kineticorp produced a simulation where the Chevrolet was lowered to its stock height and the rear left wheel of the Toyota was stiffened so that it would not deform, consistent with Dr. Renfroe's opinions.

The resulting simulation of the lowered Chevrolet was similar in most respects to the subject accident simulation. Kineticorp used the HVE-3D simulation to evaluate the accelerations that would have been experienced by the vehicle and at the seating location of Abigail Bacho. The accelerations seen in the simulation of the lowered Chevrolet were more severe than those seen in the subject accident simulation. Figure 36 is a plot comparing the total accelerations during the first 100 milliseconds for both HVE-3D simulations for the vehicle center of gravity and the third row left seated position.

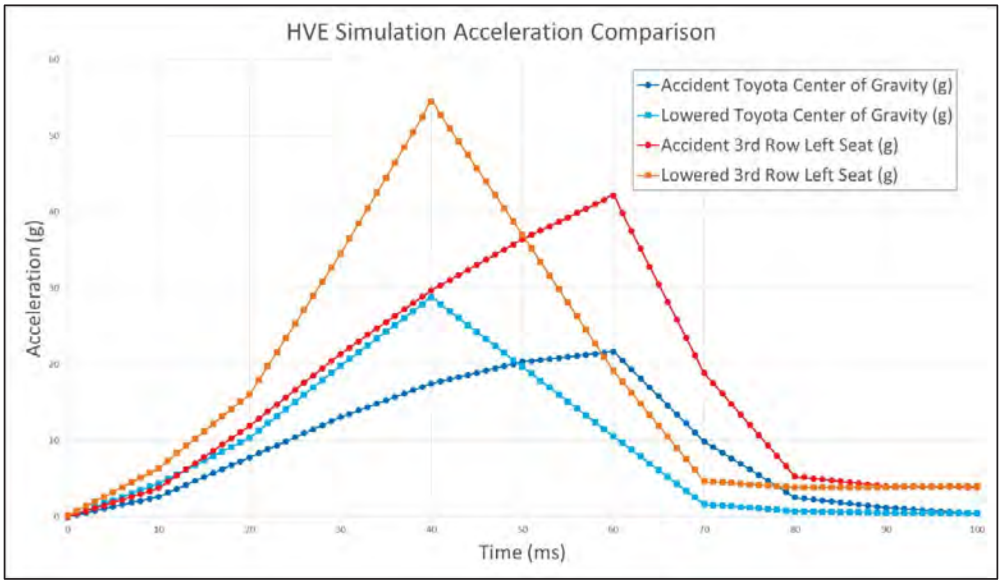


Figure 36 – HVE-3D Accident Acceleration Comparison Plots

As seen in the figure, due to the increased wheel stiffness the peak acceleration of the vehicle was increased from about 22 to about 29 times gravity. Similarly, Abigail Bacho would have experienced greater peak accelerations increasing from 42 to nearly 55 times gravity.

Figure 37 contains views of the Toyota vehicle model at the end of the two simulation runs. As seen in the images the deformation is not significantly different when comparing the subject Toyota on the left to the modified Toyota on the right. This is due in part to the impacting Chevrolet vehicle deforming around the stiffened wheel. Had the Toyota's wheel been able to deform in the simulation of the lowered Chevrolet, it is likely that the deformation patterns would have been almost identical.

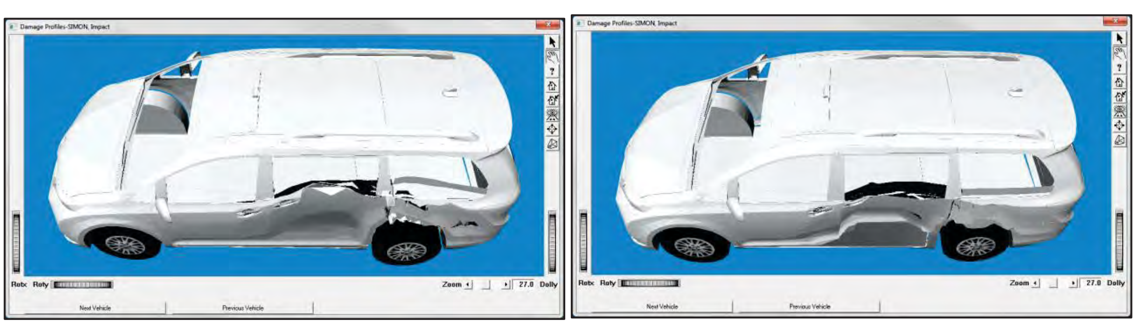


Figure 37 – HVE-3D Toyota Model Deformation
Subject Accident Simulation (left) vs. Lowered Simulation (right)

The simulation of the lowered Chevrolet shows that the accelerations experienced by the third row left position would have been more severe than the subject accident and that the intrusion would not have been prevented.

The total impact energy in the subject accident was at least 73 percent greater than the standard NCAP side impact test. The height of the impacting vehicle contributes little to the severity compared to the weight and speed of the vehicles involved in the impact.

Closing

The opinions and conclusions expressed in this report were reached to a reasonable degree of engineering certainty based on our investigation and analysis to date. We reserve the right to critique opposing experts after having the opportunity to review their file materials and testimony. Further information, data, investigation or analysis may lead us to revise or supplement these opinions and conclusions. Kineticorp may produce additional graphics and animations for use at trial.

Sincerely,

Stephen J. Fenton, P.E.

Principal Engineer

RC-BRYSON 001083

Appendix A
List of Provided Materials

Georgia Uniform Motor Vehicle Accident Report dated 12/22/12
Newman Police Department Incident/Investigation Report dated 12/22/12

- **Photographs**
  - Police photographs
  - Brake inspection photographs from plaintiff disclosures
  - Accident scene and vehicle inspection photos from plaintiff's initial disclosure
  - Photographs of lift kit and tires.
  - Adverse vehicle, Bacho vehicle and scene inspection photos by Gray (from Plaintiff disclosures)
  - Plaintiff exemplar stock and lifted vehicle photos

- **Video**
  - Dash cam video
  - Police video – Taylor Long interview
  - Geico expert brake inspection video
  - Abigail Bacho memorial videos
  - Crash test animations (head 14 inches away; head 18 inches away)

- **Audio**
  - 911 call
  - Witness statements
    - Natalie Bacho
    - Rodney Brown
    - Victoria Clinton
    - Francisco Corrilo
    - Vanessa Corrilo
    - Charles Moore
    - Audra Womack

- **Deposition Transcripts *(with Exhibits*)***
  - Ken Dunn
  - Paul Lewis, Jr.*
  - David Renfroe* (ROUGH)
  - T. Forcht Dagi, M.D.* (ROUGH)

- **Expert Reports**
  - Chandra Thorbole (Thorbole Simulation Technologies) 08/27/14
  - David Renfroe (Renfroe Engineering) 08/26/14
  - David McAllister (Accident Reconstruction Consultant) 08/25/14
  - Paul Lewis, Jr. (Bio Forensic Consulting) 08/27/14
  - Michael Daniels (Economics Consultant) 08/27/14
  - T. Forcht Dagi (Neurological Surgery) 08/28/14
      - Dagi file materials
  - David Strayer (Professor – University of Utah) 10/29/14

- **Legal Documents**
  - Summons and Complaint
  - Answer
  - Defendant Rough Country's Initial Disclosures
  - Defendant's First Continuing Interrogatories to Plaintiffs
  - Defendant's First Continuing Requests for Production to Plaintiffs
  - Defendant's First Continuing Requests for Admissions
  - Defendant's Exhibits to Mandatory Disclosures (Exhibit C)
  - Subpoena to Children's Healthcare of Atlanta Egleston
  - Plaintiffs' Initial Disclosures
  - Plaintiff's non-redacted Exhibit A
  - Plaintiffs' Response to Defendant's First Set of Requests for Production of Documents
  - Plaintiffs' Responses to Defendant's First Continuing Requests for Admissions
  - Plaintiffs' Response to Defendant's First Set of Interrogatories
  - Verification of Interrogatories
  - Plaintiffs' Supplemental Response to Defendant's First Set of Requests for Production of Documents
  - Plaintiffs' First Set of Requests for Admission to the Defendant Rough Country
  - Plaintiffs' Response to Defendant's Second Set of Interrogatories
  - Plaintiffs' First Set of Interrogatories to the Defendant Rough Country Plaintiffs' First Request for Production of Documents to the Defendant Rough Country
  - Defendant's Second Continuing Interrogatories to Plaintiffs
  - Defendant Rough Country's Responses to Plaintiffs' First Set of Interrogatories
  - Defendant's Response to Plaintiffs' First Request for Production of Documents to the Defendant Rough Country
  - Defendant Rough Country's Response to Plaintiffs' First Set of Requests for Admissions
  - Plaintiffs' Response to Defendant's Third Continuing Interrogatories
  - Order Extending Deadlines
  - Defendant's Brief in Support of Motion to Quash and for Protective Order
  - Defendant's Motion to Quash and for Protective Order
  - Plaintiffs' Response to Defendant's Second Set of Requests for Production of Documents

- **Other Documents**
  - HIPPA forms
    - Abigail Bacho
    - Stephen Bacho
    - Hannah Bacho
    - Natalie Bacho
    - Charles Moore
    - Charlotte Bacho
  - Plaintiffs' Initial Disclosure documents
    - AVCHD folder

    - Gray inspection photos
    - Radiology disks 1-3
    - Newman PD Collison Analysis Report
    - Brake inspection photographs
    - Police photographs
    - Newman Times-Herald news article
    - Accident report
    - Article re: Abby Bacho
    - Billing/Medical records
        - Children's Healthcare of Atlanta
        - Emory Clinic
        - American Medical Response
    - Abigail Bacho birth certificate
    - CDR downloads
    - Abigail Bacho death certificate
    - Police diagram of intersection
    - Letter re: preservation of vehicle
    - Newman Fire Department Report
    - Bacho vehicle photos
    - Year book cover
    - Year book page
- Plaintiffs' Discovery Response documents
    - Abigail Bacho videos
    - Charles Moore medical records
    - Charlotte Bacho medical records
    - Hannah Bacho medical records
    - Natalie Bacho medical records
    - Stephen Bacho medical records
    - Family photos
    - Photos of Abigail Bacho
    - Letter to Taylor Long from DCR – notice of representation
    - David Rayfield user info for Coweta County Solicitor's Office
    - Affidavit of Taylor Patrick Long
    - Charlotte Journal (composition book)
    - Abigail Bacho various emails
    - Letters to Abigail Bacho from: Hannah; Matthew Bacho; Turstin
    - Natalie – victim impact statement
    - David Rayfield open records request
    - Preservation letter to Long, 05/20/13
    - Emails from Sandy Wisenbaker to David Rayfield re: Taylor long case & open records request
    - Victim impact statements
    - When Something Terrible Happens book

- Link to 6in GM Suspension Lift Kit purchasing page (http://www.roughcountry.com/gm-suspension-lift-kit-276.html)
- Witness Statements
    - Audra Womack
    - Charles Moore
    - Francisco Aaron Corrilo
    - Natalie Bacho
    - Rodney Brown
    - Vanessa Corrilo
    - Victoria Clinton
    - Damon Rosser
    - Rodney Brown
- Warning to driver decal
- FMVSS126 -Preliminary Data
- FMVSS126 on a 2014 Silverado with Rough Country Suspension -Final Report
- CARFAX Vehicle History Report on 1GCEK19R6XR124996
- Lift kit installation invoice
- Parts list
- Taylor Patrick Long file
- Georgia Code - Ga. Code Ann., § 40-8-61
- Letter to C. Beans re: expert deposition dates, 09/11/14
- Scaling file
- Stature-for-age and Weight-for-age percentiles – 2 to 20 years: Girls
- Head injury criterion
- Expert Challenge Report – David Renfroe
- Defendant's request for production documents (2, 3, 4, 7, 8, 9, 10, 16, 19, 20, 22, 25, 42, 55)
- Documents and articles obtained by Defendant's counsel
- Enhancing Vehicle-to-Vehicle Crash Compatibility Progress Report, January 2007
- NHTSA's Recent Compatibility Test Program, Paper No. 05-0278
- NHTSA Side Impact Phase-In Reporting Requirements, RIN 2121-AJ10
- NHTSA's Research Program for Vehicle Compatibility, Paper No. 307
- NHTSA NCAP Moving Deformable Barrier Side Impact Test, NHTSA No. MB5104
- NHTSA Bumper Q & A's
- NHTSA Front –to-Side Vehicle Compatibility Meeting Memorandum, 05/19/04
- 1988-98 Chevy C/K Lift Kit Buyer's Guide
- Intrusion in Side Impact Crashes, SAE Paper 2007-01-0678
- Geometric Compatibility in Near Side Impact Crashes, Paper No. 243
- Bumper Height Study: Mendoza v. Heckthom
- Side Impact Crashworthiness Evaluation Crash Test Protocol (Version VII), May 2014
- Bumper and Grill Airbags Concept for Enhanced Vehicle Compatibility in Side Impact: Phase II
- NHTSA Vehicle Aggressivity and Fleet Compatibility Research papers
- Various media articles